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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/027,683	12/21/2001	Edwin Charles Weldon	AM-6180	2033
32588	7590	12/08/2003	EXAMINER	
APPLIED MATERIALS, INC. 2881 SCOTT BLVD. M/S 2061 SANTA CLARA, CA 95050			MCDONALD, RODNEY GLENN	
			ART UNIT	PAPER NUMBER
			1753	
DATE MAILED: 12/08/2003				

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

**Application No.**

10/027,683

**Applicant(s)**

WELDON ET AL.

**Examiner**

Rodney G. McDonald

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☐ Responsive to communication(s) filed on \_\_\_\_.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-43 is/are pending in the application.
- 4a) Of the above claim(s) 1-21 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 22-43 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 01 April 2002 is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. §§ 119 and 120

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) ☐ All b) ☐ Some \* c) ☐ None of:  
1. ☐ Certified copies of the priority documents have been received.  
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.  
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).  
\* See the attached detailed Office action for a list of the certified copies not received.
- 13) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.  
a) ☐ The translation of the foreign language provisional application has been received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

### Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) \_\_\_\_ 6) ☒ Other: See Continuation Sheet.

Continuation of Attachment(s) 6). Other: IDS of 7-17-03 and IDS of 3-28-02.

**DETAILED ACTION**

***Election/Restrictions***

Restriction to one of the following inventions is required under 35 U.S.C. 121:

- I. Claims 1-21, drawn to a method of roughening a ceramic surface, classified in class 216, subclass 16.
- II. Claims 22-43, drawn to a ceramic product, classified in class 204, subclass 298.11.

The inventions are distinct, each from the other because of the following reasons:

Inventions I and II are related as process of making and product made. The inventions are distinct if either or both of the following can be shown: (1) that the process as claimed can be used to make other and materially different product or (2) that the product as claimed can be made by another and materially different process (MPEP § 806.05(f)). In the instant case the process as claimed can be used to make other and materially different product such as a component for a ceramic processing chamber that uses heat treatment instead of physical vapor deposition.

Because these inventions are distinct for the reasons given above and have acquired a separate status in the art as shown by their different classification and recognized divergent subject matter, and the search required for Group I is not required for Group II, restriction for examination purposes as indicated is proper.

During a telephone conversation with Shirley Church on 11/21/03 a provisional election was made without traverse to prosecute the invention of Group II, claims 22-43. Affirmation of this election must be made by applicant in replying to this Office action.

Claims 1-21 withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

Applicant is reminded that upon the cancellation of claims to a non-elected invention, the inventorship must be amended in compliance with 37 CFR 1.48(b) if one or more of the currently named inventors is no longer an inventor of at least one claim remaining in the application. Any amendment of inventorship must be accompanied by a request under 37 CFR 1.48(b) and by the fee required under 37 CFR 1.17(i).

***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 22 and 23 are rejected under 35 U.S.C. 102(e) as being anticipated by O'Donnell et al. (U.S. Pat. 6,620,520).

O'Donnell et al. teach ***a component*** resistant component ***of semiconductor processing equipment*** such as a plasma chamber. (See abstract)

In O'Donnell et al.'s invention ***the component of the chamber is first surface prepared by cleaning and grit or bead blasting to provide a more chemically and physically active surface for bonding. (Compare to Applicant's component)*** Prior to coating, the surface of the substrate is preferably thoroughly cleaned to remove

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surface material such as oxides or grease. Further, the surface can be roughened by known methods such as grit blasting prior to coating. By grit blasting, the surface area available for binding can be increased which can increase the coating bond strength.

***The rough surface profile can also promote mechanical keying or interlocking of the coating with the substrate. (Compare to Applicant's required mechanical interlocks)*** For aluminum reactor components, it is particularly desirable to roughen the component surface, ***anodize the roughened component surface and again roughen the anodized surface prior to application of the zirconia toughened ceramic coating. (Compare to a ceramic surface with the mechanical interlocks)***

(Column 5 lines 1-16)

***Aluminum oxide is formed by anodizing. (Column 5 lines 35-38) (Compare to Applicant's required aluminum oxide)***

***Components of the chamber are typically made from metal or ceramic. (Column 7 lines 31-32)***

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein

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were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 22, 23 and 25-32 are rejected under 35 U.S.C. 103(a) as being unpatentable over O'Donnell et al. (U.S. Pat. 6,620,520).

O'Donnell et al. teach **a component** resistant component **of semiconductor processing equipment** such as a plasma chamber. (See abstract)

In O'Donnell et al.'s invention **the component of the chamber is first surface prepared by cleaning and grit or bead blasting to provide a more chemically and physically active surface for bonding. (Compare to Applicant's component)** Prior to coating, the surface of the substrate is preferably thoroughly cleaned to remove surface material such as oxides or grease. Further, the surface can be roughened by known methods such as grit blasting prior to coating. By grit blasting, the surface area available for binding can be increased which can increase the coating bond strength. **The rough surface profile can also promote mechanical keying or interlocking of the coating with the substrate. (Compare to Applicant's required mechanical interlocks)** For aluminum reactor components, it is particularly desirable to roughen the component surface, **anodize the roughened component surface and again roughen the anodized surface prior to application of the zirconia toughened**

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**ceramic coating. (Compare to a ceramic surface with the mechanical interlocks)**

(Column 5 lines 1-16)

**Aluminum oxide is formed by anodizing. (Column 5 lines 35-38) (Compare to Applicant's required aluminum oxide)**

**Components of the chamber are typically made from metal or ceramic.**

(Column 7 lines 31-32)

**One or more intermediate layers can be provided between the zirconia toughened ceramic coating and the surface of the component. (Column 7 lines 59-61)**

**As shown in Fig. 4 a first intermediate coating 80 is optionally coated on a reactor component 70 by a conventional technique. The first intermediate coating 80 can have a suitable thickness such as from 0.001 inches to 0.05 inches. (Column 7 lines 63-68; Column 8 lines 1-7) (Compare to Applicant's bond coat layer and required thickness)**

After depositing the optional first intermediate coating 80 onto the reactor component 70, the plating can be blasted or roughened, and then overcoated with the **second optional coating 90 (Compare to Applicant's sacrificial top layer)** or the zirconia toughened ceramic 100. **A roughened layer 80 provides a particularly good bond. (Compare to Applicant's bond coat layer)** Desirably, the second intermediate coating 90 imparts a high mechanical compression strength to the coating 80 and minimizes formation of fissures in the coating 90. (Column 8 lines 8-16)



***The second intermediate coating 90 can have a thickness such as from 0.001 inches to 0.05 inches. (Column 8 lines 21-24) (Compare to Applicant's required sacrificial layer thickness)***

***The first and second intermediate coating may be made of any one of more materials employed in conventional plasma processing chambers. Examples of such materials include metals, ceramics and polymers. Particularly desirable metals include refractory metals. (Column 8 lines 27-31) (Compare to Applicant's required layers being of metal including aluminum metal and refractory metals)***

It is contemplated that ***the first and second intermediate layers 80 and 90, which are optional may be any one of the above-mentioned materials such that the coatings are the same or different depending on the desired properties.***  
(Column 8 lines 42-45) ***(Compare to Applicant's required different layers)***

The zirconia toughened ceramic components or coatings according to the present invention can decrease levels of ***metal and particulate contamination***, lower costs by increasing the lifetime of consumables and reduce the levels of corrosion of chamber parts. (Column 9 lines 47-50) ***(Compare to metal layer giving off material to be sacrificial)***

The differences between the present claims and the O'Donnell et al. is where the mechanical interlocks are undercut is not discussed, is where the sacrificial layer is aluminum is not discussed, is where the range of thickness of the sacrificial layer is not discussed, is where the bond coat layer has a thermal expansion coefficient which is no more than about 20% higher or lower than the coefficient of thermal expansion of the

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ceramic is not discussed, and the range of thickness of the bond coat layer is not discussed.

As to the mechanical interlocks being undercut the interlocking or keying feature is believed to suggest undercutting since to be keyed the layer must fit in a hole in the substrate like a "key" to a door in order to mate to make a strong bond. (Column 5 line 9)

As to the sacrificial layer being aluminum the layer 90 can be a metal. Metal covers aluminum as long as the aluminum layer imparts the desired properties. (Column 8 lines 30 and 45)

As to the range of thicknesses of the sacrificial layer, it would be obvious to one of ordinary skill in the art at the time the invention was made to have selected a known thickness in the prior art's range which is within the range of applicant's claims because it has been held to be obvious to select a value in a known range by optimization for the best results, see *In re Aller*, et al., 105 U.S.P.Q. 233.

As to where the bond coat layer has a thermal expansion coefficient which is no more than about 20% higher or lower than the coefficient of thermal expansion of the ceramic O'Donnell et al. suggests utilizing refractory material for the bond coat layer which is what Applicant utilizes. (Column 8 lines 30-31)

As to the overlapping range of thicknesses of the bond coat layer when compared to the present claims, the subject matter as a whole would have been obvious to one having ordinary skill in the art at the time the invention was made to have selected the overlapping portion of the range disclosed by O'Donnell et al.

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because overlapping ranges have held to be a prima facie case of obviousness, see *In re Malagari*, 182 U.S.P.Q. 549.

The motivation for utilizing mechanical interlocks with undercuts is that it allows for increasing coating bond strength. (Column 5 lines 8-10)

The motivation for utilizing aluminum is that it allows for selecting a desired property of the component. (Column 8 line 45)

The motivation for utilizing a particular thickness for the sacrificial layer is that it allows for allowing it to be processed further. (Column 8 lines 19)

The motivation for utilizing a bond coat layer which has a thermal expansion coefficient which is no more than about 20% higher or lower than the coefficient of thermal expansion of the ceramic is that it allows for selecting a desired property of a component. (Column 8 line 45)

The motivation for utilizing a determined range of thickness of the bond coat layer is that it allows it to be processed further. (Column 7 line 68)

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified O'Donnell et al. by utilizing undercut mechanical interlocks, by utilizing a sacrificial layer of aluminum, by utilizing a determined range of thickness for the sacrificial layer, by utilizing a bond coat layer which has a thermal expansion coefficient which is no more than about 20% higher or lower than the coefficient of thermal expansion of the ceramic, and by utilizing a determined range of thickness of the bond coat layer as taught by O'Donnell et al.

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because it allows for increasing coating bond strength, for selecting a desired property of the component, and for allowing it to be processed further.

Claim 24 is rejected under 35 U.S.C. 103(a) as being unpatentable over O'Donnell et al. as applied to claims 22, 23 and 25-32 above, and further in view of Singh (U.S. Pat. 5,558,789).

The difference not yet discussed is the method in which the mechanical interlocks are formed.

Singh teaches a method of producing an improved adherent interface between a film or coating and a substrate of metal, ceramic, or composite material by laser treatment of the surface. Semi-periodic microscale surface structures are made by laser irradiation. (See Abstract)

The motivation for laser treating is that it allows for production of an adherent interface. (See Abstract)

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified O'Donnell et al. by utilizing a laser machining technique to form mechanical interlocks as taught by Singh because it allows for providing an adherent interface between a coating and substrate.

Claims 33, 34 and 36-43 are rejected under 35 U.S.C. 103(a) as being unpatentable over O'Donnell et al. (U.S. Pat. 6,620,520) in view of Hong et al. (U.S. Pat. 5,897,752).

O'Donnell et al. is discussed above and all is as applies above. (See O'Donnell et al. discussed above)

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The differences between O'Donnell et al. and the present claims is that O'Donnell et al. do not teach the plasma chamber being a sputter plasma chamber with the component being a deposition ring.

Hong et al. teach a plasma chamber which is a physical vapor deposition chamber which is also known as sputtering. (See Abstract) The clamp ring in Hong et al. can be formed of an insulating ceramic ring with a metallic film on its top surface. (See Column 6 lines 40-44)

The motivation for utilizing a clamp ring comprised of a ceramic and a metal is that it allows for controlling the sputtering characteristics of the plasma including the energy and directionality of the sputtered particles. (Column 6 lines 44-49)

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified O'Donnell et al. by utilizing as the plasma chamber a sputtering chamber and to have utilized as the chamber component a deposition ring as taught by Hong et al. because it allows for controlling the sputtering characteristics of the plasma including the energy and directionality of the sputtered particles.

Claim 35 is rejected under 35 U.S.C. 103(a) as being unpatentable over O'Donnell et al. in view of Hong et al. as applied to claims 33, 34 and 36-43 above, and further in view of Singh (U.S. Pat. 5,558,789).

The difference not yet discussed is that the method for forming the mechanical interlocks is not discussed.

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Singh is discussed above and all is as applies above. (See Singh discussed above)

The motivation for forming mechanical interlocks by laser machining is that it allows for forming an adherent interface between a film and a substrate. (See Singh discussed above)

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have utilized laser machining as taught by Singh because it allows for forming an adherent interface between a film and a substrate.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Rodney G. McDonald whose telephone number is 703-308-3807. The examiner can normally be reached on M- Th with Every other Friday off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nam X. Nguyen can be reached on 703-308-3322. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9310.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0661.



Rodney G. McDonald  
Primary Examiner  
Art Unit 1753

RM  
December 1, 2003